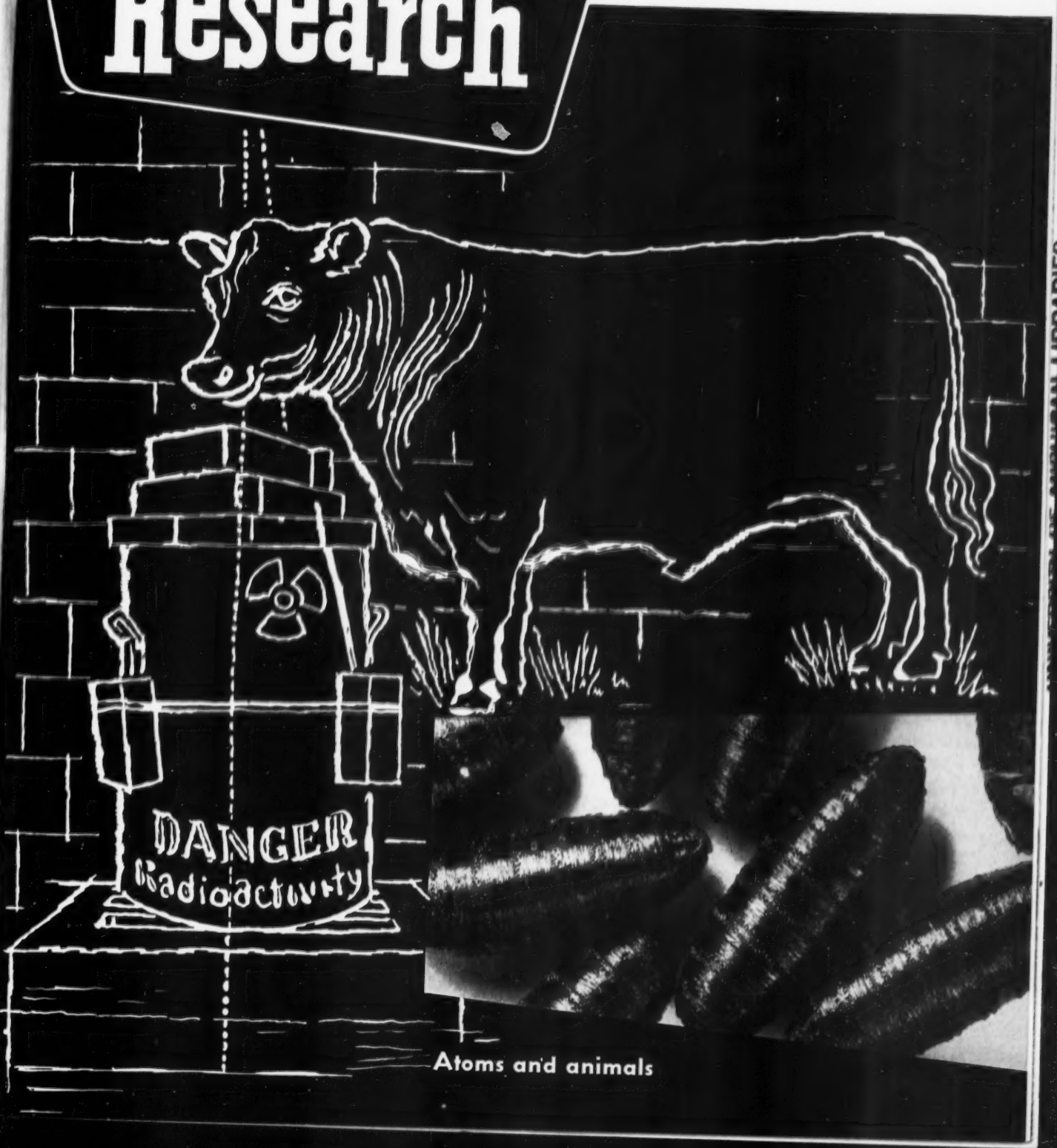
# AGRICULTURAL Research

OCTOBER 1954




Atoms and animals

AGRICULTURAL
# Research

VOL. 3—OCTOBER 1954—NO. 4

JOSEPH F. SILBAUGH—MANAGING EDITOR

## THE INCREASE

Congress has voted its confidence in agricultural research by providing a net increase of $12,311,000 in funds for this fiscal year—$71,211,000 as compared with $58,900,000 for fiscal year 1954.

The increase includes $2,450,000 for Agricultural Research Service, together with $1,900,000 to get foot-and-mouth research under way at the new Plum Island laboratory (AGR. RES., Sept. 1954, p. 10), $5,732,000 for work at State agricultural experiment stations, $1,267,000 for the Agricultural Marketing Service, $930,000 for the Forest Service, and $140,000 for the Foreign Agricultural Service.

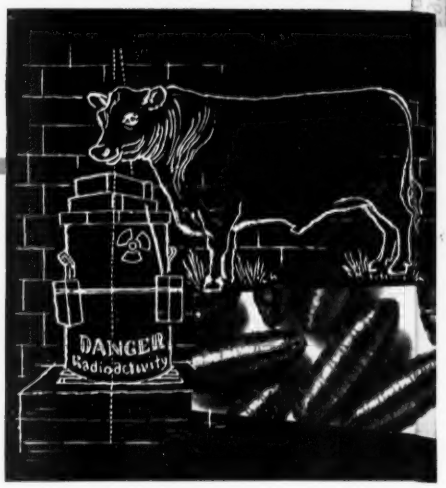
These funds will enable researchers to open additional studies on some of the pressing problems that farmers face. Unfortunately, research has lagged far behind farm needs in a number of fields. Since many of these problems can't be answered until some basic new knowledge comes to light, fundamental research will be emphasized in many cases.

Here, broadly, is how ARS will use the increase: $801,000 for expanding crop research—such matters as controlling diseases and pests, improving crops, and studying the effects of insecticidal residues; $511,000 for strengthening farm and land management research—conserving and managing soil and water, improving farm machinery, ginning cotton, helping farmers reduce costs and shift production into more profitable lines; $245,000 for working on urgent disease problems of livestock and poultry; $73,000 for developing information on nutrients in food and using food for improved nutrition; $320,000 for expanding research to develop new and improved uses for agricultural products.

The funds for State experiment stations should do much to encourage additional support from both private and public sources. Furthermore, this money will help resume the expansion of experiment station research contemplated in the 1946 amendment to the Bankhead-Jones act. Each State will get an increase ranging from $25,000 to $171,000.

Naturally, these increases won't meet *all* the needs. But agricultural research is in better shape financially than it has been for a number of years. An understanding of the needs as well as the responsibilities of research seems to be developing. It's now up to researchers to demonstrate by results that this confidence is completely justified.

AGRICULTURAL RESEARCH SERVICE
United States Department of Agriculture




**ATOMIC ENERGY may prove to be an ally of southeastern livestock producers in their battle with the screwworm. An experiment in progress on a tropic island should point the way (p. 8).**

## Contents





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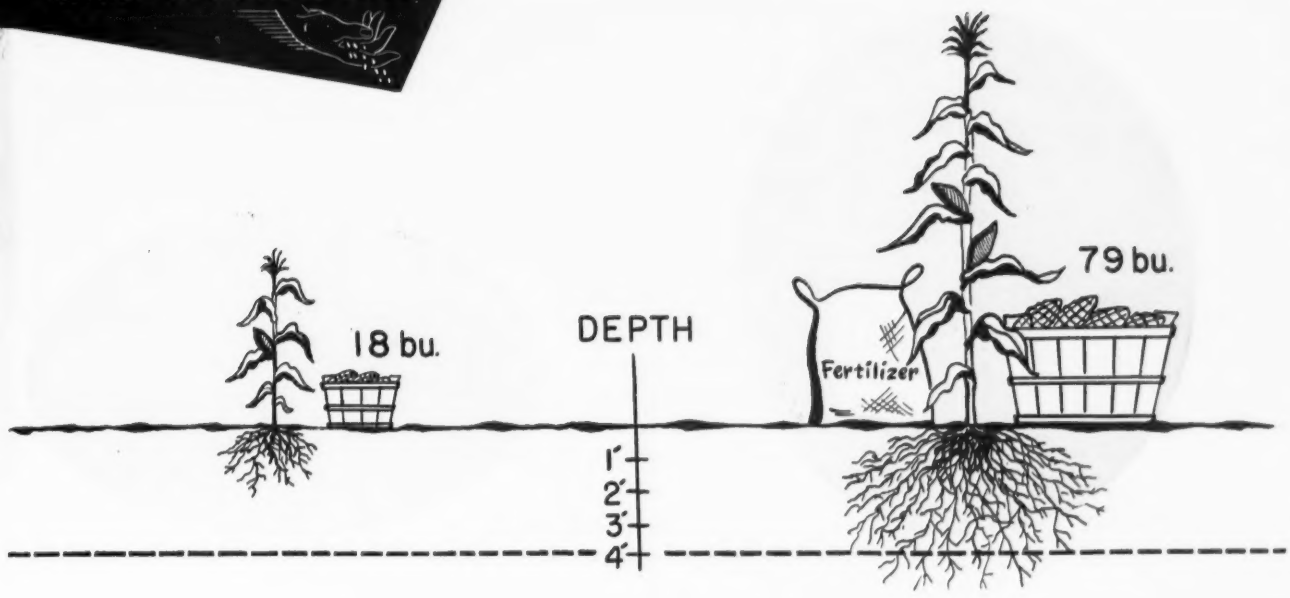


# Sending corn for water

A GOOD SOIL program of fertilization and crop rotation, like a mountain reservoir, means more water for the crops. But mountain water must be brought to the plants, whereas good soil management makes plants go after the water.

Six years of cooperative research in Central Missouri by USDA and the Missouri experiment station showed that well treated corn actually sends more elaborate root systems deeper and farther to tap new water supplies—and yields far better.

ARS soil conservationist D. D. Smith reported a 6-year average yield of 100 bushels of corn on well-fertilized plots in a corn-wheat-meadow-meadow rotation and 23 bushels on untreated plots in a corn-oats rotation. In the extremely dry year of 1953 the plots yielded 79 bushels and 18 bushels of corn, respectively.

**Though higher yields** with fertilizer and a good rotation came partly from greater water consumption, the big gain came from more efficient *use* of available water—5,600 gallons to the bushel of corn *with* good management, but 21,000 gallons to the bushel *without* good management.

**During the 1953** drought (60 percent normal rainfall), corn on well managed plots actually got a seventh more water than others. The extra came mostly from the subsoil, beyond reach of weaker root systems. By August 17, fertilized corn had left only 1 inch of available water in the top 3½ feet of soil, compared with 4½ inches without treatment. By September 1, corn had used 97 percent of the available moisture on treated plots, but only 72 percent on the untreated ones. Favored plants reach farther for water that's there.

Good soil management increases the water supply in other ways. Creation of a stronger above-ground plant canopy tames the driving, surface-packing force of hard rains that favor runoff, also casts denser shade and cuts water loss through surface evaporation. And the better-rooted crop offers more and deeper trickle channels, lets more water seep in.

Untreated plots on this Missouri claypan soil were put into a 2-year corn-oats rotation without fertilization. The treated plots were conditioned for high productivity with 5 tons of lime, 1,000 pounds of rock phosphate, and 100 pounds of potash—as dictated by soil tests—and put into a corn-wheat-meadow-meadow rotation. Every fourth year they got a supplement of phosphorus and potash. And corn on the treated plots also got 300 pounds of 3–12–12 starter and 100 pounds of nitrogen.

**Water runoff** averaged about 3 inches per growing season from unfertilized corn, less than 1 inch from fertilized corn of the 4-year rotation. Soil loss was proportional—2¼ tons and ½ ton respectively.

Most years, subsoil moisture recovers during the winter, but last winter the rains were too scant. In the unprecedented drought of last summer even fertilized corn burned up. But good soil treatments still appear a good gamble to help offset less severe droughts. Major drought is rare.☆

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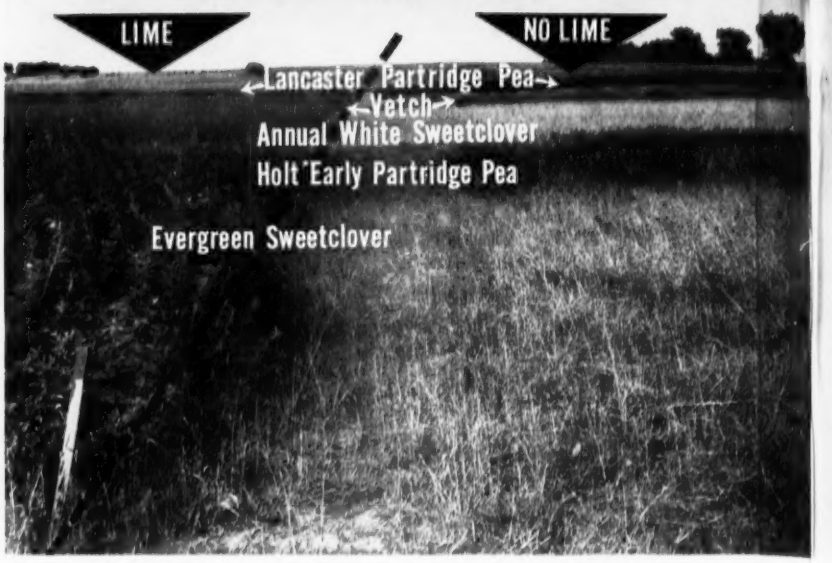
# A sandy farm comes back




**LIMING EXPERIMENT** showed which of the needed soil-building legumes were naturally adapted to this sandy soil. Vetch and partridge peas grew about as well without lime as with it. Their nitrogen boosted yield of other crops in rotation.

**TOO IMPOTENT** to grow its own vegetative cover, this blowing, sandy land needed help. Corn was grown again with ample nitrogen to produce a strong crop cover and heavy residues for the winter.

**A YEAR LATER** the same field had won its first battle and returned a good crop. It was then ready to continue in a corn and rye-vetch rotation, destined to build up the soil and return profits.

SANDY LANDS can be stabilized against wind erosion and restored to productivity under various systems of conservation farming. This is clear from 4 years of farm-scale research in northeast Nebraska.

A sandy farm in Pierce County—rented with prize money from a soil conservation contest—is the site of this experiment in soil conservation and management. Under leadership of USDA soil scientists F. L. Duley and J. C. Russell, it is a joint operation of the Agricultural Research Service, the Pierce County Soil Conservation District, the Nebraska experiment station, and the Soil Conservation Service.

After 4 years of operation, the study has shown how to farm blowsand—common in the Great Plains—at a profit, while building its productivity and erosion resistance.

**The Pierce farm** has a decades-old history of grain farming, as does most of the sandy land in that area. Each spring the winds had sifted and removed clay and silt from the plow layer and left infertile sand (AGR. RES., Sept. 1954). Ultimately the land had lost its power to produce an adequate protective stubble (AGR. RES. June 1954).

**Like most poor-land** farmers, the researchers had to make the Pierce farm pay from the start with cash crops. They decided on a system that would leave crop residues to protect the soil surface while cash crops were growing. This necessitated liming and fertilizing at the start—practices still being continued in the most profitable plans. It called for careful timing of operations and for techniques and implements that leave crop residues on the surface. And it posed difficult problems of weed control and eradication where mulch is retained.

The compelling need for a quick ground cover was met by raising crops of rye, vetch, sweetclover, partridge pea, and lespedeza on various plots in 1950. Rye yielded about 6 bushels of grain and ⅓ ton of straw per acre without soil treatment—up to 15 bushels of grain and ¾ ton of straw when given 26 pounds of nitrogen the first of May, but somewhat less than the latter when fertilizer was withheld until May 20.

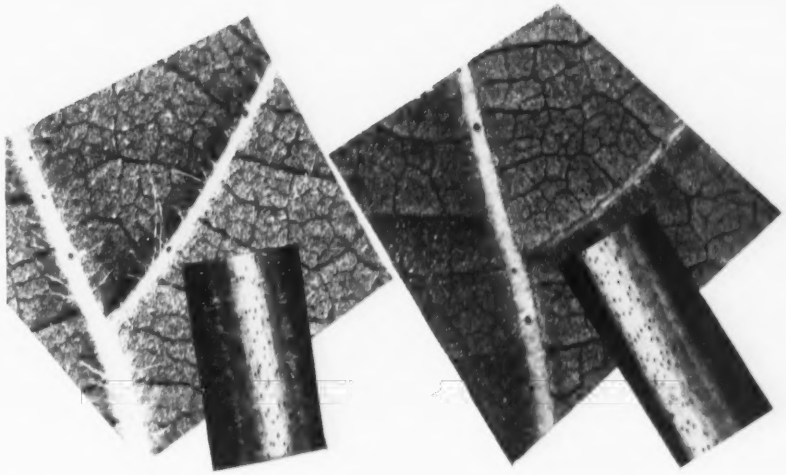
To give immediate income, but at the same time build up the land, the researchers planted part of the farm in 1951 and again in 1952 to cash crops (corn and rye) and part to soil-building crops, especially nitrogen-fixing legumes (Evergreen and Madrid sweetclovers, and vetch, lespedeza, and partridge pea).

**Corn following** a non-legume produced 16 bushels per acre in 1951 and 26 bushels in 1952 without fertilizer. In 1952 corn showed an advantage from applications of lime and phosphorus—and even greater advantage from following legume crops, ranging up to double yields or better. Vetch, biennial sweetclover, and annual sweetclover had outstanding influence on yield of the next crop.

Methods of establishing and managing alfalfa and grassland stands are also being studied.

Another 2 or 3 years (expected duration of the project) should show merits of many soil conserving factors in a variety of combinations. Among the alternatives there should be programs to return many a sandy Plains farm to profitable production.☆

**TOP CASH CROP,** *rye-and-vetch,* **yielded light grazing and $98 an acre in grain and seed. Cut jointly by combine, they left a good ground cover and some nitrogen for the next crops in the rotation, corn and oats.**



# Breeding trash out of cotton

COTTON BREEDERS NOW HAVE AVAILABLE just the gene they need—borrowed from a wild lintless cotton—for breeding smooth-leaf cottons easy to free of trash after machine-picking.

Hairs make the leaf and stem trash cling to lint. Excessive "pepper trash" from machine-picked commercial (hairy-leaf) varieties calls for expensive lint cleaning. It sometimes lowers the grade of the cotton.

Smooth-leaf trash, on the contrary, readily comes out of the cotton in normal cleaning and ginning. It saves extra cleaning, saves grade.

USDA has seed available (*to breeders only*) of an experimental hybrid line that is practically free of leaf, stem, and bract hairs. The line was developed by geneticist J. R. Meyer of the Agricultural Research Service, in cooperation with the Mississippi experiment station.

The wild smooth-leaf species *Gossypium armourianum* was crossed with one of the commercial hairy-leaf upland cottons, *G. hirsutum*. In 1951, one plant in the second generation had not only extremely smooth leaves, stems, and bracts, but also vigor, productivity, and unusually good lint for this type of material.

This character from *G. armourianum* ("$D_3$ smoothness," to the breeders) is far smoother than two experimental lines of Delta Pine Land (DPL) variety, themselves 1 grade better than standard DPL.

**Producing two generations a year** (a winter generation in Mexico), Meyer backcrossed the *G. armourianum* x *G. hirsutum* hybrids twice to the upland parent and selfed them. Thirteen of the progeny bred true for smoothness in 1953—retained the one dominant smooth gene.

Although these plants have not been thoroughly tested for yield and quality, there apparently are no undesirable characters genetically linked to the smoothness. On the contrary, the highly-desirable characters of earliness, prolificacy, and lack of vegetative branching (almost exclusive fruit branching) have shown up in some plants.

Two of the better lines were field-grown this summer to produce enough seed for breeders. The stock is now true-breeding for $D_3$ smoothness. After a cross and perhaps 4 to 6 back-crosses to desirable commercial lines, new cottons should emerge with $D_3$ smoothness. They should otherwise be practically identical to the commercial cotton.☆

# HAYING INNOVATION

COMBINING MOWER AND RAKE as a tractor-mounted unit saves a large part of the labor and tractor time in making hay and silage from meadow crops at the USDA Agricultural Research Center, Beltsville, Md.

This combination enables the operator to cut, rake, and windrow his forage in one trip over the field. Ordinarily those jobs would require two trips.

Forage handled in this manner may be cured as hay in the windrow or be picked up green from the windrow by a field chopper and made into silage.

ARS engineers who devised the combination found that hydraulic lifting makes the tractor with this equipment quite maneuverable and adaptable to field irregularities commonly encountered in haymaking. That's the key to its success.☆

**TRACTOR-MOUNTED** *mower and roller-bar rake can cut windrow at same time at half cost. Hydraulic lifting lets operators turn sharply, back up, clear ditches and terraces.*

**PICKUP CHOPPER** *(conventional labor saver) can follow immediately behind mower-windrower, chop the grass, and blow it into a truck. Then it's ready to be blown into the silo.*

**PAY-OFFS FOR 30 YEARS** *of patient tobacco breeding are multiple-disease-resistant lines. This Burley line is resistant to three diseases pictured on the next page, will reach growers soon.*

## Ounce of prevention for TOBACCO

AFTER HALF A CENTURY of patient research, tobacco diseases are rapidly yielding to a series of new multiple-disease-resistant varieties and—this year—to the antibiotic drug streptomycin sulfate.

USDA pathologist F. A. Todd at Raleigh, N. C., and agronomist H. E. Heggestad at Greeneville, Tenn., got near-perfect control of bluemold and wildfire, respectively, last spring by spraying infected plant beds with a solution of this drug (200 parts per million).

It's uncertain whether the antibiotic will prove practical. But wildfire immunity in varieties under development and bluemold resistance in breeding material are realities.

These and other bred-in controls—fully automatic and costless for the farmer, in contrast to chemical methods—understandably afford major optimism.

E. F. Clayton and his fellow pathologists in ARS and the State experiment stations have found that commercial tobaccos came from one of the most disease-prone of the 60 tobacco species. Wild species—distant cousins of commercial tobacco—have now supplied resistance to 6 of the 7 most important diseases (black root rot, black shank, bluemold, mosaic, root-knot nematode, and wildfire) and complete immunity to 3 of them. Resistance to the seventh major disease (bacterial wilt) came from the commercial tobaccos.

Disease makes growers try for 4 pounds in order to produce 3—makes them lose about $300 million a year, a sum exceeded by the losses of only 1 other crop (cotton) and by the total crop value of only 7 crops.

The million-acre flue-cured tobacco industry has the new Dixie Bright 101 variety, resistant to black shank, bacterial wilt, and fusarium wilt and low in nicotine. The scientists are busy adding to it available genetic resistance to black root rot, root-knot nematode, and bluemold and higher-level resistance to black shank.

**Great improvements are unfolding** for the half-million-acre Burley industry, too. Last year's new root-rot-and-black-shank-resistant varieties, Burley 11A and 11B, are a tremendous improvement over the 30-year-old varieties that were resistant to the single disease root rot. Soon there will be a Burley variety resistant to root rot, wildfire, and mosaic. Experimental varieties with resistance to these diseases are already in test plots.

An up-coming Havana cigar binder breeding selection, being developed jointly with the Wisconsin experiment station, has immunity to mosaic and resistance to root rot.

While disease control is a primary objective, the ARS tobacco program revolves around plant breeding in the broader sense. A variety must measure up to many standards: leaf yield and usable percentage of it; leaf shape, size, color, and ripening uniformity; fire-holding capacity; and desirable alkaloidal content (nicotine, nornicotine, anabasine, and about 20 other chemicals).

**Getting disease-resistant,** high-quality, high-yielding tobacco took the nationwide teamwork of many professions—plant breeders, pathologists, physiologists, chemists, agronomists, and technicians—and of farmers and manufacturers, too. All play equally important roles under the over-all guidance of ARS scientist D. M. Crooks and State experiment station leaders.

**BLACK ROOT ROT,** first disease to yield to tobacco breeders, was destructive (small plant) until resistant varieties (two middle plants) saved the crop. Immunity (strong-rooted plant) is a likely prospect.

**SINGLE RESISTANCE** isn't enough. All 3 of these varieties resist root rot; 2 of them, black shank (disease shown on center row); and experimental variety (right) resists both, plus wildlife and mosaic.

**NEW BURLEY 11A,** resistant to black shank and root rot, fell before wildfire; but in this same plant bed, an experimental line resistant to wildfire, mosaic, and root rot, withstood the disease.


**1** 40,000 screwworms are raised weekly at Orlando ARS laboratory for use in experiment on island of Curacao. Maggots mature in blood-horsemeat mixture (upper tray), then drop to sand tray below to enter the pupal or resting stage of their life cycle.


**2** Pupae are sexually sterilized by exposure to gamma radiation from cobalt in this 1-ton lead cylinder. The mirror is positioned so that operator can see into the container and work with the radioactive cobalt without entering the radiation field.

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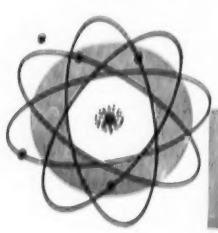


# peration S

ON THE CARIBBEAN ISLAND of Curacao, USDA entomologists hope to prove that the vicious screwworm can be vanquished from an area.

Using one of their most modern weapons—atomic energy—ARS scientists are working with island authorities in an attempt to eradicate this pest of livestock from the small Dutch possession. This pilot research may break the way for the much bigger job of driving the screwworm out of the southeastern United States.

Underlying this promising experiment is one basic fact: female screwworm flies mate only once. Entomologists are exploiting this habit by saturating the wild population with thousands of laboratory-reared male flies—normal appearing but made sexually *sterile* by exposure to gamma rays from radioactive cobalt supplied by the Oak Ridge National Laboratory in Tennessee.

**Infiltrating sterile males** will theoretically reduce the next screwworm generation by the same degree that they outnumber normal males. For example, turning loose five sterile males for every normal male fly should cut the potential population by about 80 percent.

Our entomologists got good results when they first field-tested this idea on Sanibel, a small island off the coast of Florida. But flies from the mainland moved in later to replenish the screwworm population.

On Curacao, 50 miles from the nearest land, there's no chance of natural infiltration.

**Here, the new Operation Screwworm** began last spring. Among the first jobs was measuring the strength of the enemy. Then the entomologists released the first consignment of 52,000 sterile screwworm males on March 26 and followed up with 100 flies a week for each of Curacao's 170 square miles of area.

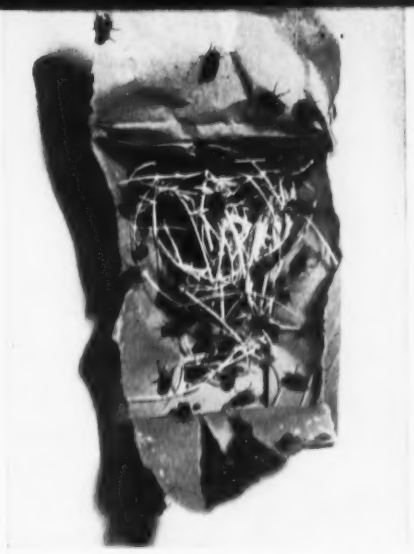
Beginning August 1, the researchers stepped up the attack, doubling the weekly infiltration rate of sterile males. On September 1, the release rate was again doubled. This should finish the job.

Eradication of the screwworm from Curacao will furnish entomologists with the knowledge and encouragement for a possible campaign against this pest in Florida.

Each spring and summer in the United States, screwworms migrate north from Florida and Texas to infest

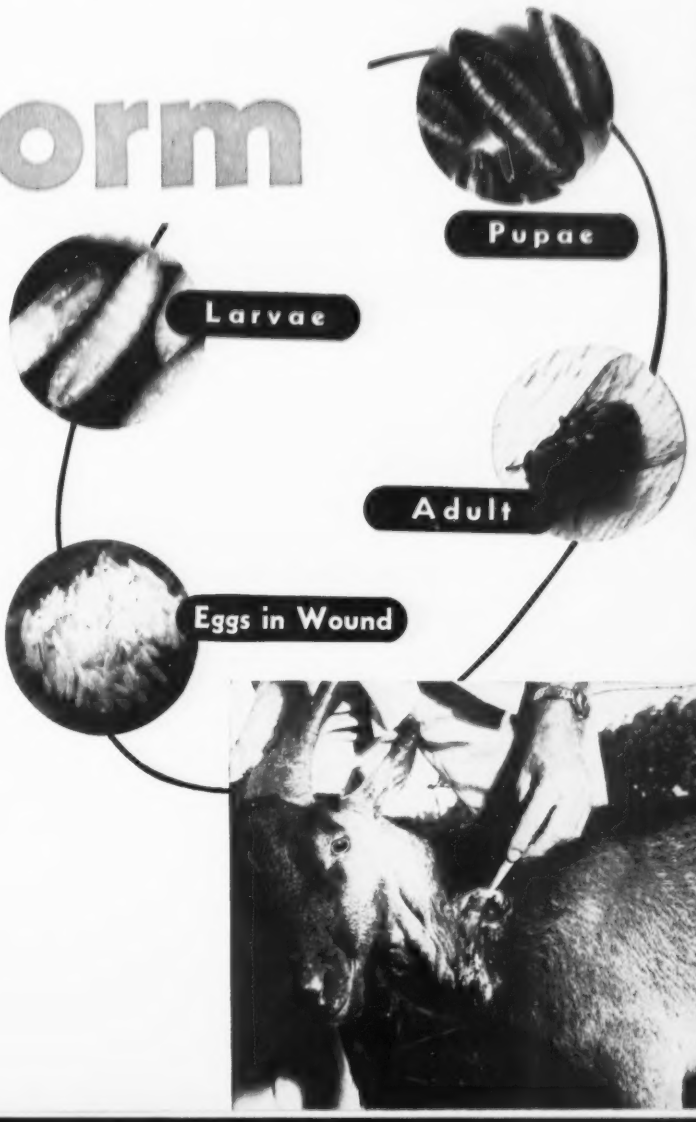
3 Shipments of sterile screwworms reach Curacao twice a week by air in these paper bags. The bottoms of the bags are coated with sand-and-flour ballast to keep them from drifting excessively when they are dropped on the island from airplanes.

4 Pilot drops bags of hatched adult flies through tube so as to distribute 100 sterile males per square mile. Bags are torn slightly prior to dropping to allow flies to escape. About 50 males emerge from 130 pupae that are originally put in the bag.



5 Sterile males now go to work for researchers by mating with native female flies, which mate only once. Entomologists believe they can eliminate the pest in this way. If successful, the method might be used in the southeastern part of the U. S.

# n screwworm




the wounds of midwestern and southern livestock. The eggs that screwworm flies lay in wounds hatch into scores of maggots. Feeding on meat and blood, they can sap the strength of an animal—or even kill it. Although ARS scientists have developed a wound smear that destroys the maggots and egg-laying adults, screwworms still cost livestock producers millions of dollars a year.

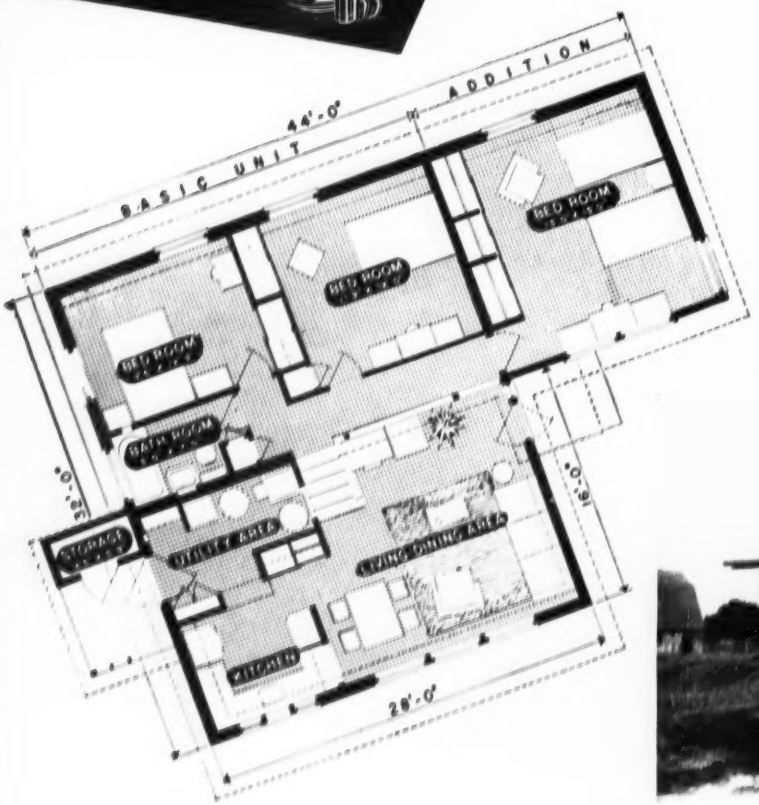
Each winter, their advance line falls back into southern Florida and Texas, where temperatures are warm enough for them to survive. The entomologists believe they can likely eliminate the pest from the Southeast by attacking the Florida infestation during the winter.

The Texas source of infestation presents an almost impossible eradication problem, since screwworm flies can move in easily across the Mexican border.

**But the entomologists believe** Texas screwworms could be kept from moving back into a screwworm-free Southeast. The Gulf Coast climate and marshlands apparently form a natural barrier, because there weren't any screwworms east of the Mississippi till infested cattle were shipped to Georgia and Florida about 1934.☆

## Normal-use test

# for an Experimental far




**1** Split-level expansible house can grow third bedroom; redwood wall makes partition, door replaces window. Oversize brick make structural walls without cinder-block backing. The plank-and-beam roof wears corrugated aluminum cover—easy to put on, durable; corrugations carry off moisture.

**2** Storage includes this big unit in living-dining area, a wall in each bedroom, and large closet on back porch. Six-step stairway leads to bedrooms, bath. Partitions go only part way up, making house airy. Floor is concrete slab (55-pound roll roofing below to bar moisture) covered with asphalt tile.

**3** Beyond dining area is U-shaped kitchen. At left is part of picture window. Most of the brick has been left exposed to try this thrifty device in moderate or warm climate; if walls prove too cold or damp, brick can later be furred out and covered (as in kitchen, bath). Heating ducts, registers are set in concrete floor around edge of building.

# al farmhouse

A NEW FARMHOUSE is being tested in normal use at the Agricultural Research Center, Beltsville, Md.

Built near the dairy barns, the house is home for a milker's family while ARS researchers get information on construction features that may be adapted to farm housing.

This is USDA's newest expansible house—split-level for a sloping lot. The basic unit (896 square feet) includes a large living-dining area, kitchen, utility room, and six steps up—a bath and two bedrooms. A third bedroom could be added later (1,170 square feet total).

**The design is suited** to either frame or brick. Chosen for this experimental house were the new large-size brick (called by the trade SCR, meaning "structural clay research"), used without cinder blocks.

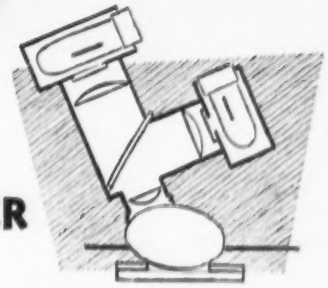
Heating is the modern perimeter type, with ducts and registers set in the edge of the floor. Warmth is well diffused by this forced-air system, and it may prove to be a thrift feature for this type of home.

ARS architect Jack Herrington designed this house. He styled it modern throughout, in line with the trend to this type among farm families. Guidance in suiting the plan to farm-family requirements came from Mrs. Lenore S. Thye, ARS housing and household equipment specialist.

**Cost of constructing** the basic unit in brick has been estimated at $9,300 by one builder near Washington, D. C. This includes labor and heating unit, refrigerator, and range.

Working drawings for this house (Plan 7128) can be obtained at nominal cost from Extension agricultural engineers at many State colleges.☆

## POULTRY



## GREEN-ROT SPOTTER

ONE OF THE BIGGEST HEADACHES in the egg business is green rot, a bacterial infection that spoils eggs—even under cold storage—and sometimes rots them on the way from farm to store. An offensive odor announces trouble to housewives the moment they break out such eggs.

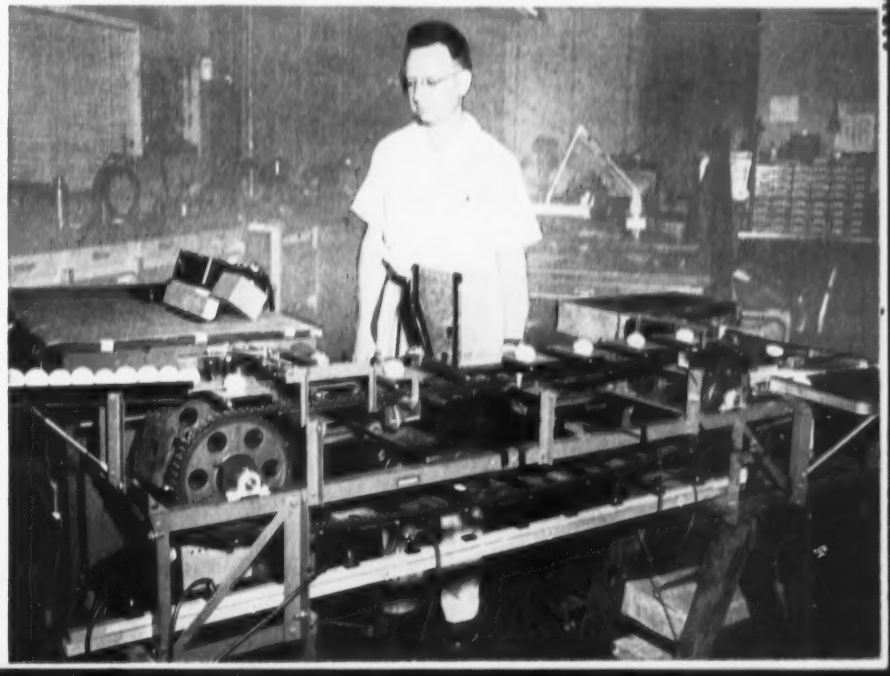
Green rot (AGR. RES., Jan-Feb. 1953, p. 14) gets its name because the albumen of infected eggs fluoresces green under ultraviolet radiation, so-called black light. USDA scientists used this characteristic as the key to development of a machine that will automatically detect eggs with green rot and sort them from normal eggs.

Badly rotted eggs candled by ultraviolet light show enough green to be seen by the human eye, and some handlers are using this system to catch the worst eggs. But low levels of infection and spoiled brown-shell eggs can't be detected visually. The machine, however, can find them.

Agricultural engineers K. H. Norris and J. D. Rowan of Agricultural Marketing Service and poultry husbandman A. W. Brant of Agricultural Research Service say their machine is best suited for packers, wholesalers, chain retail grocers, and other large operators. These groups lose the most money on green rot because spoilage usually shows up after the infected eggs have been in storage for 2 or 3 weeks.

Bacteria usually get on a shell through unsanitary farm practices—dirty nests, for example—and enter the egg if it's not cleaned and handled properly. As the bacteria multiply, the egg begins to rot.☆

**GREEN-ROT DETECTOR** beams "black light" through eggs and electronic device measures color wave lengths. Normal eggs show some green, but wave length increases sharply on an infected egg. It's automatically rejected as it comes off the machine.



## New southern watermelon looks like a plant breeder's dream

There's something for everyone in USDA's new southern watermelon, the Charleston Gray—something for consumers, retailers, transportation companies, shippers, farmers, and for the sly lad with his eye on the patch.

The variety goes to growers next spring highly recommended by cooperators who have tested it.

This is a heavy-yielding, anthracnose-resistant, fusarium-resistant, scald-free melon. Its hard rind makes it a good handler. Its shape and size—long, symetrical, and averaging 38 to 35 pounds—are popular with consumers and adapted to quartering or halving for retail. It is relatively free of the hollow-heart, white-heart, and gourd-neck defects. Its thin rind and black seeds appeal to consumers. And, best of all, this watermelon is sweet, flavorful, crisp, and tender.

Charleston Gray is another example of the work of plant breeders in drawing upon improvement factors collected throughout the world. Anthracnose resistance came from the melon's native land, Africa. Wilt resistance came from an Australian variety, Hawkesbury. Our own Garrison variety supplied the high quality.

The name Charleston Gray comes from the melon's light green (but grayish-appearing) color and the place of its origin. It was hybridized in 1946 at the ARS Southeastern Vegetable Breeding Laboratory, Charleston, S. C. Then it was selfed and selected for 5 years, and increased and tested for the last 3 years. Seeds, available from seedsmen and retailers, are in good supply for 1955.☆

## Frozen juice concentrate helps make better use of strawberries

A sparkling clear frozen strawberry-juice concentrate that's stable and won't gel solves the problem of how to use strawberries too small, misshapen, or blemished for marketing in fresh and frozen packs.

Concentrates up to 12-fold by volume can be made from these berries by a process developed by USDA scientists at the ARS Western Regional Research Laboratory, Albany, Calif., in cooperation with private industry.

About 10 percent of the sound strawberries delivered to packing houses are misfits. These berries may affect the appearance of a pack but they don't impair the quality of a byproduct such as strawberry juice. Appearance, other than color, isn't important in this case.

Although such berries heretofore have been made into single-strength frozen juice for sale to jelly manufacturers, high water content results in excessive shipping and storage costs. Variability of soluble solids content (the important part of the juice) raises difficulties in manufacturing a uniform product and in pricing the juice in proportion to worth. The tendency of single-strength juice to gel in storage—because the pectin has not been removed—creates inconvenience. And single-strength juice becomes semi-opalescent and produces cloudy jelly.

The new process, similar to that for making frozen apple-juice concentrate, consists of recovering volatile essences from depectinized and clarified juice and returning the recovered essences to the concentrate.

The reconstituted concentrate has a clear brilliance and shows no tendency to gel. Flavor and color are comparable to those of the starting juice.

Commercial production of seven-fold concentrate has been successful. The concentrated juice can be used not only in jelly manufacture but as the flavoring constituent for strawberry sherbet, candies, or beverages.☆

## Chemical treatment tenderizes skins of canned purple plums

To overcome a market handicap of canned Italian prune plums, USDA scientists have devised a simple and effective way to tenderize their skins.

Purple plums have fine flavor, but skin texture is undependable—varies with season, variety, maturity, and growing area. The fruit, a fairly new canned product, is packed almost exclusively in the Pacific Northwest.

Unsuccessful in tenderizing the skins before canning, A. M. Neubert and G. H. Carter of the ARS Fruit and Vegetable Products Laboratory in Prosser, Wash., got results with the chemical sodium hexametaphosphate added to the canning sirup. As little as 0.2 to 1.0 percent of this compound tenderized the prune skins within 1 day without bad effect on flavor or appearance.

Neubert and Carter say canners can use a tenderometer—instrument for testing puncture resistance—to standardize skin texture in connection with the chemical treatment. The instrument is more reliable than a judge's taste. A few experimental packs with each new lot of plums should enable the canner to treat at a minimum.☆

AIRPLANES SPRAY DDT on gypsy-moth caterpillars at 160 acres a minute, a cost of only about a dollar an acre. This beats such tedious control methods as trapping caterpillars under a fold of burlap (left) or destroying egg clusters with creosote.

# Surprise attack

## BY THE GYPSY MOTH

GYPSY MOTH caterpillars were found this summer chewing away at Michigan hardwoods—some 500 miles from their normal area of operations behind quarantine barriers in New England and eastern New York.

No one knows how this forest pest slipped past the inspection lines that have confined it for most of its 85 years in the United States.

Nor does anyone yet know what will be the success of DDT sprays applied in June to 86,000 acres that include and surround the infestation on the outskirts of Lansing. But cooperating Michigan and USDA entomologists are aiming at *eradication* of the pest—if not this year, then in the next year or two.

The entomologists are using the same treatment and survey methods that have succeeded in previous Federal-State efforts to wipe out isolated gypsy-moth outbreaks in the East.

This Midwest invasion proves that the leaf-eating pest can evade quarantines—and that it can become a threat a long way from New England.

It happens that the outbreak closely follows a thorough appraisal of the gypsy moth's potential for damage and spread, both inside and outside the infested area. Agricultural Research Service scientists concluded in 1952 that any spread of the past beyond the infested area in the Northeast must be prevented and that outbreaks such as the one in Michigan must be promptly stamped out.

**The study group** recommended that the gypsy moth be contained by establishing a barrier zone around the perimeter of the presently infested area—a barrier zone to be kept free of the pests by the most stringent cooperative control and quarantine program possible.

This recommendation, endorsed last fall by the Regional Coordinating Committee on Gypsy Moth Control of the Council of State Governments, was based on two significant findings:

**1.** In the last 20 years, gypsy moths have destroyed more than $6½ million worth of forests and forest products in New England. The unmeasurable losses were estimated to be as great or greater: the aesthetic and recreational damage to infested and defoliated woods, the increased fire hazard and the lowered ability of dead and dying trees to hold soil and water, the reduced future timber yields from infested trees.

**2.** An 11,000-mile survey trip beyond the infested area indicated that

more than 100 million acres of midwestern and southern hardwood forests are susceptible to infestation and damage by the gypsy moth. Today's total infested area of New England and eastern New York contains only 30 million acres; of these, the trees on only slightly more than 5 million acres are classed as susceptible to defoliation damage.

The entomologists also report that the degree of susceptibility varies. Some of the uninfested forest areas are highly vulnerable to gypsy-moth damage. For example, the types of trees (mostly oaks), their management, and general growing conditions make the southwestern Ozark and southern Appalachian forests much more vulnerable than any extensive area in Massachusetts, the State that has borne the brunt of the attack.

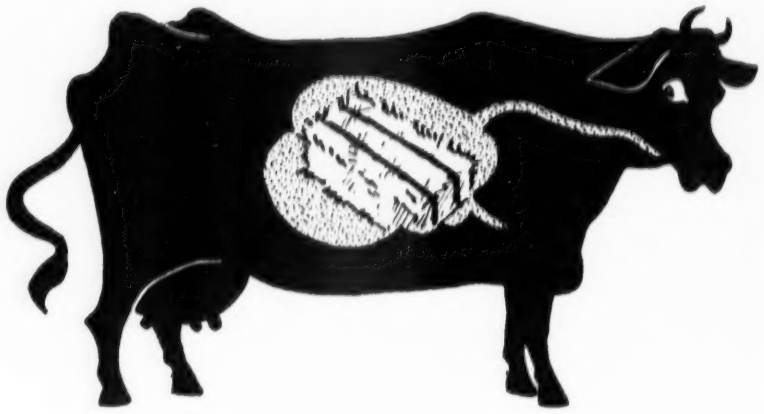
**The gypsy moth's** career as a U. S. forest pest began at Medford, Mass., in 1869, where moths escaped from a French scientist who had imported them from Europe. He hoped to cross them with the silkworm and establish an American silk industry. Instead, he brought on what at present seems to be a war-without-end.

At first the insect spread slowly. By 1890, however, damage in Massachusetts had increased to such an extent that the State legislature passed the first American anti-insect law. Working under the authority of this legislation, Massachusetts managed to contain the pest for a few years. But it was discovered in Rhode Island in 1901, Connecticut and New Hampshire in 1905, New York in 1912, and Vermont in 1915.

In 1920, a severe outbreak occurred near Sommerville, N. J., but prompt Federal-State action wiped out this infestation. Similar action against later outbreaks in eastern Pennsylvania also brought virtual eradication. Minor infestations appearing from time to time in this area have been promptly destroyed.☆

## DAIRY

• **QUICK ANSWER ON DIGESTIBILITY**



# How much is used?

MEASURING FORAGE DIGESTIBILITY by the conventional method gives accurate results but takes time. It involves weighing both the forage and the resulting excrement to find out how much dry matter is left.

Now, with a new procedure devised by USDA dairy chemists E. A. Kane and W. C. Jacobson at the Agricultural Research Center, Beltsville, Md., researchers can make such determinations quicker and more precisely.

Various short cuts have been used in place of the conventional procedure from time to time. Agricultural Research Service scientists Kane and Jacobson started out with one in which a group of plant pigments appearing in both forage and cow feces are measured. When the pigment units are read on a spectrophotometer—an instrument that measures the pigment by its color wave length—forage digestibility can be calculated according to the ratio of pigment in feces to pigment in forage.

A *single* plant pigment called pheophytin is the key in the new technique. Greater precision is possible in measuring just one pigment than in dealing with a group. Although the pheophytin isn't isolated in a pure state, this method allows pheophytin to exert a much greater influence on spectrophotometric readings than other pigments present.

One difficulty was that pheophytin, a decomposition product of chlorophyll, shows up mainly in feces. The scientists needed to measure the pigment in the forage too. They managed to do this by inventing a way of changing chlorophyll to pheophytin artificially (this change occurs naturally in a cow's intestinal tract) with an oxalic-acid treatment.☆

# FARM FIRE FIGHTING

ON FARMS, UNCONTROLLED FIRES can be disastrous. In 1953, the loss amounted to $139,000,000. All too often, organized preparations for fighting rural fires are inadequate or entirely lacking.

Protection through rural fire-fighting companies offers many advantages, and such organizations are increasing.

In 1953 more than 340 fire-protection districts were operating in Illinois. About 40 percent were qualified with equipment and personnel so farmers who lived close to the stations and had such facilities as telephones and water storage could get lower fire-insurance rates.

Rural fire-fighting organizations are also found in Oregon, Maryland, California, Michigan, Nebraska, and other States.

USDA has supervised a study on the organization and operation of such departments. Recommendations coming out of this ARS study are:

In planning a program, first get the facts from the county or State's attorney, State fire marshal or insurance commissioner, nearby fire chiefs, State vice-president of The International Association of Fire Chiefs, and State rating and inspection bureau engineer.

**Decide on the size of the area** to be included in the fire-protection district. Make a diagram of the proposed area, showing roads, telephone and water facilities, and settlements. Devise a fire-alarm plan. Get the assessed valuation of the taxable property in the area. Estimate the initial cost of the program and outline a method of financing.

When the necessary information is gathered, call a meeting of the rural people in the area to consider adoption of the program.

This program should also provide for training of volunteer firemen, inspection of equipment, fire drills, an adequate fire station in the center of the area, a fire truck or trucks with a portable pump, and a winch and cable to pull heavy machinery from burning sheds. Chemicals, ladders, extinguishers, axes, and crowbars are also necessary.

Each property owner should do his part in having home equipment and, if possible, at least 3,000 gallons of water on hand. An extinguisher for ordinary fires and one for oil and electrical fires should be provided.

But—most important of all—keep on the lookout for fire hazards on the farm. The best fire protection is still fire prevention.☆

# Readers' REACTIONS

**Service:**

Many publications pass on to their readers the articles from AGRICULTURAL RESEARCH. Permission isn't necessary. Credit is appreciated but not required. We can usually supply prints of photographs and drawings.—ED.

**Last straw:**

I note in the article "Straw . . . promise for paper" [AGR. RES., July 1954, p. 6] that references are made to the "growing serious pulpwood shortage . . . mills have been chewing up soft pulpwoods faster than forests can grow them."

We foresters are anxious to see waste materials put to use. However, with pulpwood running out our ears in Alabama because of better fire protection and forest management, we are seeking additional users.—IVAN R. MARTIN, Extension Forester, Auburn, Ala.

● Our story attempted to give an *over-all* view—based on Forest Service survey information. Growing demands point to eventual shortages, although it is hard to say *when* needs will exceed supplies. Undoubtedly, some local markets have plenty.—ED.

**Fur piece:**

May I personally congratulate you on your fine publication.

However, may I point out that, thus far, you have completely neglected an important branch of agriculture—fur farming (mink, silver fox, etc.).—E. R. HARROWE, News Editor, *Fur Age Weekly*, New York City.

● We plan a progress report when this research is further along.—ED.

**Tracer:**

In various magazines I have run across articles that originated in AGRICULTURAL RESEARCH. Would you please inform us how we can have our name put on the mailing list?—J. B. POOLEY, Anchor Serum Company, South St. Joseph, Mo.

● Our limited free list includes such agricultural groups as researchers, agents, teachers, editors, and trade associations. A subscription is $1 a year (see p. 2).—ED.

# AGRISEARCH Notes

## HUNT: draping qualities

Cotton fabrics with significantly better draping qualities for clothing and household uses are being sought by the USDA Southern Regional Research Laboratory. Drape is important where a tailored look is desirable and appearance is a major consideration.

Fabric Research Laboratories, Boston, Mass., will conduct this research under a 2-year contract with ARS. The work will include the spinning, weaving, and evaluation of experimental fabrics from the best experimental yarns. The application and effectiveness of finishing agents in improving draping characteristics will be studied, along with other properties, such as tensile strength and elongation of the experimental fabrics.☆

## DETAILS: animal nutrition

If you want a detailed summary of the latest information on animal nutrition, you can get it in a series of booklets published by the National Research Council in cooperation with ARS and other animal nutritionists.

This series, "Nutrient Requirements of Domestic Animals," discusses proper nutrition for various breeds and weights, diet deficiency symptoms, quantities of various nutrients required at different ages, and kind and percentages of nutrients in commonly-used animal feeds.

So far, 8 booklets have been published—one each for swine, poultry, beef cattle, dairy cattle, sheep, horses, dogs, and foxes and minks. Nutrition specialists in each of these fields revise the booklets from time to time, as research throws new light on nutritional problems.

These pamphlets are available at 50¢ each from the National Research Council, Washington 25, D. C. ☆

## FIND: bluetongue vaccine

An effective new vaccine for combating bluetongue, a disease principally of sheep, is now available to American veterinarians. (See AGR. RES., May–June 1953, p. 6).

The vaccine was developed cooperatively by the USDA Agricultural Research Service, the State of California, and private industry. Research was started on the basis of earlier work in South Africa. The vaccine was approved and licensed by ARS. Four laboratories are making and distributing the vaccine commercially.

Bluetongue is an infectious disease caused by a filtrable virus, which is present in the blood, blood serum, tissue fluids, and organs of the affected animal.

This disease has caused severe losses—not only deaths but also secondary results such as screwworm infestation, weight loss, increased care, and fleece damage.☆

## INVADER: khapra beetle

The khapra beetle, unknown on this continent until last November, has been found infesting grain warehouses in 14 counties in California, Arizona, and New Mexico.

USDA entomologists who are familiar with the insect's destructive grain-feeding habits in many European and Asian countries say that, uncontrolled, it could become a serious pest of stored grain products in the southern United States, and possibly could establish itself in heated mills and warehouses in the North.

This small pest (a dermestid) looks much like some other grain-feeding beetles. Grain damaged by the yellowish-brown larvae resembles that damaged by the lesser grain borer. The beetle spreads largely through trade avenues—shipping of seed and grain and reusing sacks.

Surveys and research to control this invader are being conducted by ARS, Agricultural Marketing Service, and several States. A laboratory is being established in Arizona by AMS entomologists for on-the-ground studies of this pest. Cooperative Federal-State control and regulatory measures are also being considered.☆



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